

BAB VI

KESIMPULAN DAN SARAN

6.1 Kesimpulan

Kesimpulan yang diperoleh dari hasil analisis simpang bersinyal Badran Yogyakarta diperoleh nilai derajat kejenuhan kondisi hari libur yaitu sabtu siang pada pendekat utara 1,365, pendekat timur 1,321, pendekat selatan 1,086, dan pendekat barat 1,175. Berdasarkan pada Pedoman Kapasitas Jalan Indonesia 2014 hasil derajat kejenuhan tidak memenuhi syarat yaitu $< 0,85$.

Tundaan rerata (det/skr) diperoleh saat kondisi liburan hari sabtu siang pada pendekat utara 170,7, pendekat timur 189,2, pendekat selatan 109,6, dan pendekat barat 214,5. Panjang antrian yang diperoleh setelah analisis simpang saat kondisi libur pada pendekat utara sebesar 328 meter, pendekat timur sebesar 197 meter, pendekat selatan sebesar 205 meter, pendekat barat sebesar 259 meter. Panjang antrian pada simpang bersinyal Badran Yogyakarta tersebut terkadang mencapai ke simpang sebelumnya yang kurang lebih berada 300 meter pada pendekat utara dan pada pendekat barat terdapat jembatan yang berada kurang lebih 100 meter dari simpang tersebut. Hal ini dapat menghambat kelancaran arus lalu lintas pada ruas jalan tersebut.

Dari hasil analisis dibuat beberapa alternatif – alternatif untuk meningkatkan kinerja simpang menjadi optimal. Terdapat tiga alternatif yaitu

perubahan waktu hijau, larangan belok kiri jalan terus, dan perubahan waktu hijau beserta larangan belok kiri jalan terus dan pelebaran mulut simpang. Dari ketiga alternatif tersebut perubahan waktu hijau beserta larangan belok kiri jalan terus dan pelebaran mulut simpang yang dinilai cukup efektif untuk meningkatkan kinerja simpang bersinyal Badran Yogyakarta karena nilai derajat kejenuhan sudah mendekati syarat kelayakan Pedoman Kapasitas Jalan Indonesia 2014 yaitu $< 0,85$ sehingga panjang antrian dan tundaan rerata (det/skr) berkurang.

6.2 Saran

Perubahan Pelebaran mulut simpang pada pendekat barat berpengaruh pada jembatan yang letaknya kurang lebih 100 meter dari simpang tersebut, sebaiknya dilakukan pelebaran pada jembatan juga agar tidak terjadi tundaan pada saat di jembatan agar kinerja arus lalu lintas pada pendekat barat menjadi optimal. Alternatif perubahan waktu hijau beserta larangan belok kiri jalan terus dan pelebaran mulut simpang dinilai cukup efektif untuk simpang bersinyal Badran Yogyakarta namun perlu adanya pengaturan ulang pada waktu hijau agar waktu siklus memenuhi syarat kelayakan Pedoman Kapasitas Jalan Indonesia 2014.

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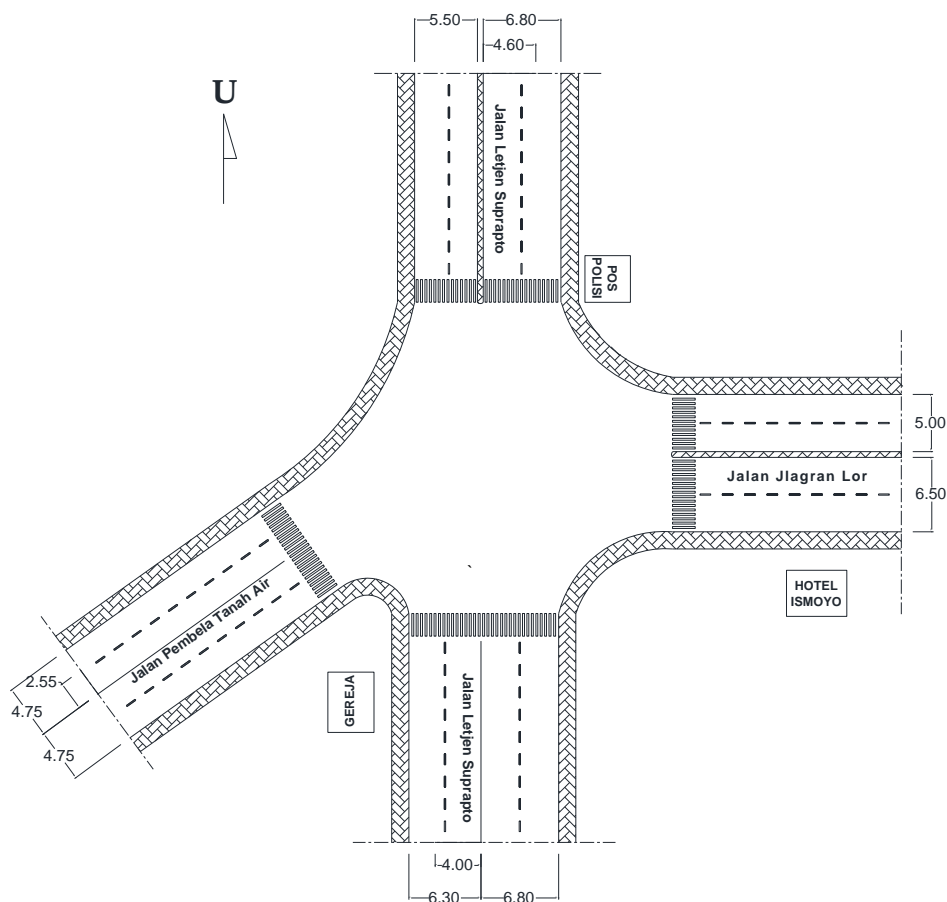
FORMULIR SIS-I

| | | |
|--|---|-----------------------|
| SIMPANG APILL DATA: GEOMETRIK PENGATURAN LALU LINTAS LINGKUNGAN | Tanggal : 13 Agustus 2016 | Ditandatangani oleh : |
| | Kota : Yogyakarta | |
| | Simpang : Jl.Letjen Suprpto-Jl.Pembela Tanah Air-Jl.Jlagran Lor | |
| | Ukuran Kota : 388.627 juta jiwa | |
| | Perihal : Pengaturan simpang empat fase | |
| | Periode : Jam puncak sore (12.45 - 13.45) hari libur | |

Sketsa Fase APILL

| Fase 1 | Fase 2 | Fase 3 | Fase 4 | Waktu siklus , c |
|------------------------|----------------|----------------|----------------|---|
| | | | | c = 135 detik |
| Waktu hilang total, HH | | | | |
| HH= Σ AH = AH 20 | | | | |
| H= 35 AH= 5 | H= 20 AH= 5 | H= 35 AH= 5 | H= 25 AH= 5 | H = waktu hijau AH = waktu antar hijau |

SKETSA SIMPANG



KONDISI LAPANGAN

| Kode Pendekat | Tipe lingkungan jalan KIM/KOM/AT | Kelas Hambatan T/R | Median Ada/Tidak | kelandaian Pendekat Tanjakan(+)/Turunan(-)% | BKijT Ya/Tidak | Jarak ke kendaraan parkir m | Lebar Pendekat | | | |
|---------------|-------------------------------------|-----------------------|---------------------|--|-------------------|--------------------------------|---------------------------|-----------------------------|--------------------------------------|------------------------------|
| | | | | | | | Pada lajur awal L m | Pada garis henti LM m | Pada lajur belok kiri LBKijT m | Pada lajur keluar LK m |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| U | KOM | R | Ada | 0 | Ya | Tidak | 6.80 | 4.60 | 2.20 | 6.80 |
| T | KOM | R | Ada | 5 | Tidak | Tidak | 6.50 | 6.50 | 0.00 | 4.75 |
| S | KOM | R | Tidak | 2 | Ya | Tidak | 6.30 | 4.00 | 2.30 | 5.50 |
| B | KOM | R | Tidak | 0 | Ya | Tidak | 4.75 | 2.55 | 2.20 | 5.00 |

FORMULIR SIS-II

| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | | | | | Ditangani oleh : | | | | | | |
|------------------|--------------|---|------------|----------|--|------------|----------|---|------------|----------|-------------------------------|------------|----------|-----------------------------------|------------------------------------|--|--|
| | | Kota : Yogyakarta | | | | | | | | | | | | | | | |
| ARUS LALU LINTAS | | Simpang : Jl.Letjen Suprpto - Jl.Pembela Tanah Air - Jl.Jlagran Lor | | | | | | | | | | | | | | | |
| | | Ukuran Kota : 388.627 Juta Jiwa | | | | | | | | | | | | | | | |
| | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | |
| | | Periode : Jam puncak siang (12.45 - 13.45) WIB | | | | | | | | | | | | | | | |
| Kode Pendekat | Arah | KENDARAAN BERMOTOR | | | | | | | | | | | | Kend.tak bermotor | | | |
| | | qkr | | | qkb | | | qSM | | | QKBM | | | RBKi Rasio belok ke kiri | RBKa Rasio belok ke kanan | QKTB Arus kend tak ber- motor kend/jam | RKTB Rasio QKBM thd (QKTB+Q KBM) |
| | | ekr terlindung = 1,0 ekr terlawan = 1,0 | | | ekr terlindung = 1,3 ekr terlawan = 1,3 | | | ekr terlindung = 0,15 ekr terlawan = 0,4 | | | Total arus kendaraan bermotor | | | | | | |
| | | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | | | | |
| | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| U | Bki / BKiJT | 79 | 79 | 79 | 8 | 10 | 10 | 254 | 38 | 102 | 341 | 128 | 191 | 0.11 | | 3 | |
| | LRS | 268 | 268 | 268 | 7 | 9 | 9 | 1486 | 223 | 594 | 1761 | 500 | 872 | | | 4 | |
| | Bka | 188 | 188 | 188 | 8 | 10 | 10 | 943 | 141 | 377 | 1139 | 340 | 576 | | 0.35 | 4 | |
| | Total | 535 | 535 | 535 | 23 | 30 | 30 | 2683 | 402 | 1073 | 3241 | 967 | 1638 | | | 11 | 0.0034 |
| T | Bki / BKiJT | 22 | 22 | 22 | 2 | 3 | 3 | 44 | 7 | 18 | 68 | 31 | 42 | 0.04 | | 0 | |
| | LRS | 172 | 172 | 172 | 2 | 3 | 3 | 485 | 73 | 194 | 659 | 247 | 369 | | | 2 | |
| | Bka | 252 | 252 | 252 | 24 | 31 | 31 | 575 | 86 | 230 | 851 | 369 | 513 | | 0.54 | 2 | |
| | Total | 446 | 446 | 446 | 51 | 5 | 36 | 1104 | 166 | 442 | 1578 | 648 | 924 | | | 4 | 0.0025 |
| S | Bki / BKiJT | 111 | 111 | 111 | 8 | 10 | 10 | 648 | 97 | 259 | 767 | 219 | 381 | 0.30 | | 6 | |
| | LRS | 266 | 266 | 266 | 7 | 9 | 9 | 1375 | 206 | 550 | 1648 | 481 | 825 | | | 7 | |
| | Bka | 29 | 29 | 29 | 3 | 4 | 4 | 99 | 15 | 40 | 131 | 48 | 73 | | 0.05 | 2 | |
| | Total | 406 | 406 | 406 | 18 | 23 | 23 | 2122 | 318 | 849 | 2546 | 748 | 1278 | | | 15 | 0.0059 |
| B | Bki / BKiJT | 252 | 252 | 252 | 11 | 0 | 14 | 1373 | 206 | 549 | 1636 | 458 | 816 | 0.64 | | 5 | |
| | LRS | 115 | 115 | 115 | 4 | 5 | 5 | 413 | 62 | 165 | 532 | 182 | 285 | | | 6 | |
| | Bka | 42 | 42 | 42 | 4 | 5 | 5 | 353 | 53 | 141 | 399 | 100 | 188 | | 0.16 | 7 | |
| | Total | 409 | 409 | 409 | 19 | 10 | 25 | 2139 | 321 | 856 | 2567 | 740 | 1289 | | | 18 | 0.0070 |

FORMULIR SIS-III

| | | | | | | | |
|---|------------------------------|---|----------|--|----------|----------|---------------|
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | |
| WAKTU ANTAR HIJAU WAKTU HILANG | | Ditangani Oleh : | | | | | |
| | | Kota : Yogyakarta | | | | | |
| | | Simpang : Jl.Letjen Suprpto - Jl. Pembela Tanah Air - Jl. Jlagran Lor | | | | | |
| | | Perihal : Pengaturan Simpang Empat Fase | | | | | |
| LALULINTAS BERANGKAT | | LALU LINTAS DATANG | | | | | Msemua |
| Kode Pendekat | Kecepatan VKB (m/dtk) | Kode Pendekat | U | T | S | B | |
| | | Kecepatan VKD (m/dtk) | 10 | 10 | 10 | 10 | (detik) |
| U | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| T | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| S | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| B | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| | | | | Penentuan Msemua | | | |
| | | | | Fase 1 --> Fase 2 | | 2 | |
| | | | | Fase 2 --> Fase 3 | | 2 | |
| | | | | Fase 3 --> Fase 4 | | 2 | |
| | | | | Fase 4 --> Fase 1 | | 2 | |
| | | | | Ksemuan Fase (3 detik per fase) | | 12 | |
| | | | | HH = \sum(Msemua+Ksemua Fase) (det/siklus) | | 20 | |

| <p align="center">SIMPANG APILL</p> <p align="center">PENENTUAN WAKTU ISYARAT</p> <p align="center">KAPASITAS</p> | | | | | | | | | Tanggal : 13 Agustus 2016 | | | | | | | | | Ditangani oleh : | | | | | | | | |
|--|---------------------|---------------|-----------------------|------------------|---|------------------------------------|---------------------------------|--------------------------|---|---------------------------|------|------|--------|------------------------|------------------|--------------|---|--------------------------------|------------------|--------------------------------|--------------------|-------------------------|--------------|--|--|--|
| | | | | | | | | | Kota : Yogyakarta | | | | | | | | | | | | | | | | | |
| | | | | | | | | | Simpang : Jalan Letjen Suprpto - Jalan Pembela Tanah Air - Jalan Jlagran Lor | | | | | | | | | | | | | | | | | |
| | | | | | | | | | Ukuran Kota : 388.627 juta jiwa | | | | | | | | | | | | | | | | | |
| | | | | | | | | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | | | |
| Periode : Jam Puncak Siang (12.45 – 13.45) WIB | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi arus lalu lintas : | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi Arus Lalu Lintas, skr/jam | | | | | | | | | Fase 1 | | | | Fase 2 | | | | Fase 3 | | | | Fase 4 | | | | | |
| Kode pendekat | Hijau dalam fase ke | Tipe pendekat | Rasio kendaraan belok | | | Arus belok kanan, qBK _a | | Lebar Efektif Le m | Arus jenuh, S | | | | | | | | Arus lalu lintas Q skr/jam | Rasio Arus, RQ/S RQ/S = Q/S | Rasio Fase RF | Waktu hijau per Fase (i) Hi | Kapasitas Ci | Derajat Kejenuhan DJ | | | | |
| | | | RBK _{iJT} | RBK _i | RBK _a | Dari arah ditinjau skr/jam | Dari arah berlawanan skr/jam | | Arus jenuh dasar S ₀ skr/jam | Faktor-faktor penyesuaian | | | | Arus jenuh disesuaikan | | | | | | | | | | | | |
| | | | | | | | | | | Semua tipe pendekat | | | | Hanya Tipe P | | S skr/jam | | | | | | | Q skr/jam | | | |
| | | | | | | | | | | FUK | FHS | FG | FP | FBK _a | FBK _i | | | | | | | | | | | |
| | | | | | | | | | $S_0 = 600 \times Le$ $S = S_0 \times FHS \times FUK \times FG \times FP \times FBK_i \times FBK_a$ | | | | | | | | $RF = \frac{RQ/S \text{ Kritis}}{RAS}$ | | $C = S$ | | $DJ = \frac{Q}{C}$ | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) | | | | |
| U | 1 | P | 0.11 | | 0.35 | 340 | 48 | 4.60 | 2760 | 0.83 | 0.95 | 1.00 | 1.00 | 1.09 | 1.00 | 2374 | 840 | 0.354 | 0.337 | 35 | 616 | 1.365 | | | | |
| T | 2 | P | | 0.04 | 0.54 | 369 | 100 | 6.50 | 3900 | 0.83 | 0.95 | 0.95 | 1.00 | 1.14 | 0.99 | 3310 | 648 | 0.196 | 0.187 | 20 | 490 | 1.321 | | | | |
| S | 3 | P | 0.30 | | 0.05 | 48 | 340 | 4.00 | 2400 | 0.83 | 0.95 | 0.98 | 1.00 | 1.01 | 1.00 | 1879 | 529 | 0.282 | 0.269 | 35 | 487 | 1.086 | | | | |
| B | 4 | P | 0.64 | | 0.16 | 100 | 369 | 2.55 | 1530 | 0.83 | 0.98 | 1.00 | 1.00 | 1.04 | 1.00 | 1296 | 282 | 0.218 | 0.207 | 25 | 240 | 1.175 | | | | |
| Waktu hilang total, HH Total, detik = | | | 20 | | Waktu siklus pra penyesuaian, cbs = 135 detik | | | | | | | | | | | | RAS = $\sum R \text{ Q/S kritis}$ = 1.049 | | | | | | | | | |
| | | | | | Waktu siklus disesuaikan = $\sum Hi + HH$ | | | | c = 135 detik | | | | | | | | | | | | | | | | | |

FORMULIR SIS-V

| | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|
| SIMPANG APILL PANJANG ANTRIAN JUMLAH KENDARAAN HENTI TUNDAAN | | | | | Tanggal : 13 Agustus 2016 | | | | | Ditangani oleh : | | | | |
| | | | | | Kota : Yogyakarta | | | | | | | | | |
| | | | | | Simpang : Jalan Letjen Suprpto — Jalan Pembela Tanah Air — Jalan Jlagran Lor | | | | | | | | | |
| | | | | | Ukuran kota : 388.627 Juta Jiwa | | | | | | | | | |
| | | | | | Perihal : Empat fase | | | | | | | | | |
| Periode : Jam Puncak Siang (12.45 - 13.45) WIB | | | | | | | | | | | | | | |

| Kode pendekat | Arus lalu lintas Q | Kapasitas C | Derajat kejenuhan DJ | Rasio hijau RH = Hi/c | Jumlah kendaraan antri (skr) | | | | Panjang Antrian PA m | Rasio kendaraan terhenti RKH | Jumlah kendaraan terhenti NKH | Tundaan | | | | |
|---|---------------------------|--------------------|-----------------------------|------------------------------|------------------------------|------|----------------------------|--------|--------------------------------|-------------------------------------|--------------------------------------|--|---|---|-----------------------------------|--------|
| | | | | | NQ1 | NQ2 | Total NQ = NQ1 + NQ2 | NQ MAX | | | | Tundaan lalu lintas rata-rata TL det/skr | Tundaan geometri rata-rata TG det/skr | Tundaan rata-rata T=TL+TG det/skr | Tundaan total T x Q ekr.det | |
| | | | | | | | | | | | | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | |
| U | 840 | 616 | 1.365 | 0.259 | 19.0 | 36.1 | 55.1 | 75 | 328 | 1.574 | 1323 | 168.3 | 2.4 | 170.7 | 143406 | |
| T | 648 | 490 | 1.321 | 0.148 | 16.6 | 25.7 | 42.4 | 64 | 197 | 1.569 | 1017 | 182.9 | 6.3 | 189.2 | 122600 | |
| S | 529 | 487 | 1.086 | 0.259 | 7.2 | 20.5 | 27.6 | 41 | 205 | 1.254 | 663 | 104.6 | 5.0 | 109.6 | 57986 | |
| B | 282 | 240 | 1.175 | 0.185 | 10.0 | 11.0 | 21.0 | 33 | 259 | 1.789 | 504 | 207.3 | 7.2 | 214.5 | 60482 | |
| Total jumlah kendaraan terhenti = | | | | | | | | | | | 3507 | Total tundaan = | | | | 384474 |
| Kend. Terhenti rata-rata, (henti/skr) = | | | | | | | | | | | 1.13 | Tundaan simpang rata-rata (det/skr) = | | | | 123.9 |

| | |
|--------|------|
| Qtotal | 3103 |
|--------|------|

$$N_{q1} = 0,25xcx \left\{ (D_j - 1) + \sqrt{(D_j - 1)^2 + \frac{8x(D_j - 0,5)}{c}} \right\}$$

$$N_{q2} = cx \frac{(1 - R_h)}{(1 - R_h x D_j)} x \frac{Q}{3600}$$

$$P_A = N_q x \frac{20}{L_M}$$

$$R_{KH} = 0,9x \frac{N_q}{Qxc} x 3600$$

$$N_{KH} = QxR_{KH}$$

$$T_L = cx \frac{0,5x(1 - R_h)^2}{(1 - R_h x D_j)} + \frac{N_{q1}x3600}{C}$$

$$T_G = (1 - R_{KH})xP_b x 6 + (R_{KH} x 4)$$

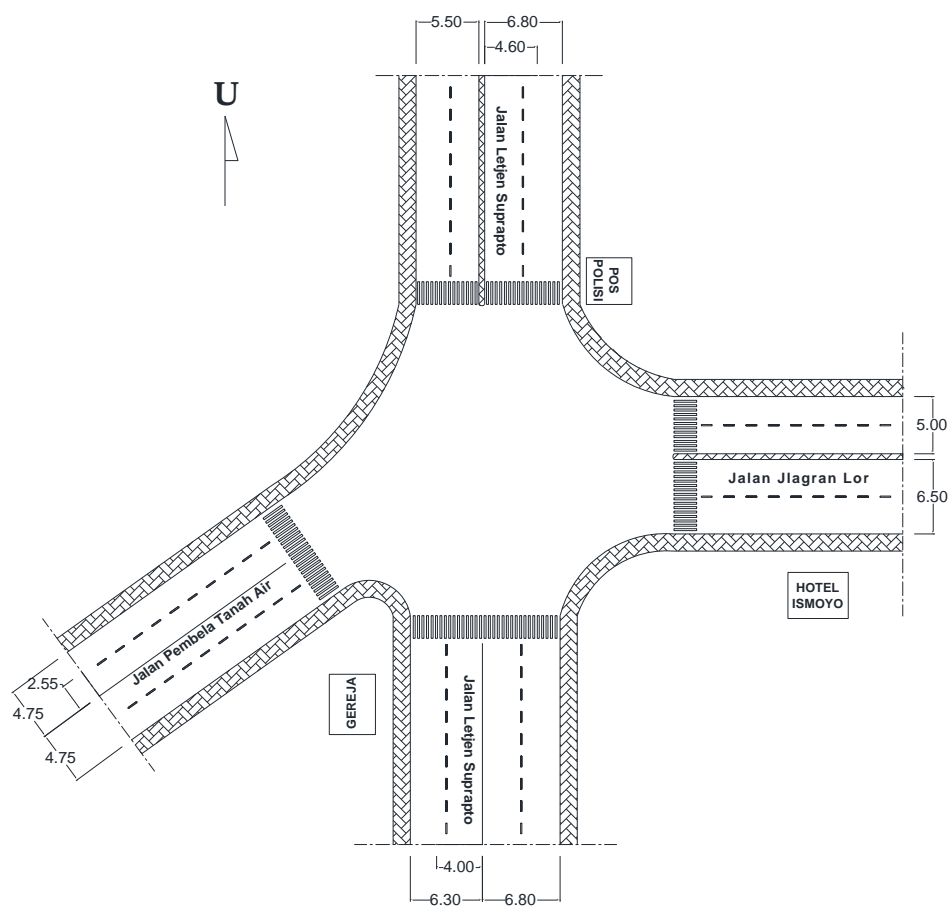
FORMULIR SIS-I

| | | | |
|--|---------------|---|-----------------------|
| SIMPANG APILL DATA: GEOMETRIK PENGATURAN LALU LINTAS LINGKUNGAN | Tanggal : | 13 Agustus 2016 | Ditandatangani oleh : |
| | Kota : | Yogyakarta | |
| | Simpang : | Jl.Letjen Suprpto - Jl.Pembela Tanah Air - Jl.Jlagran Lor | |
| | Ukuran Kota : | 388.627 juta jiwa | |
| | Perihal : | Pengaturan simpang empat fase | |
| | Periode : | Jam puncak sore (12.45 - 13.45) hari libur | |

Sketsa Fase APILL

| Fase 1 | Fase 2 | Fase 3 | Fase 4 | Waktu siklus , c |
|--------|--------|--------|--------|------------------------|
| | | | | c = 460 detik |
| | | | | Waktu hilang total, HH |
| | | | | HH= Σ AH = AH 20 |
| H= 110 | H= 110 | H= 100 | H= 120 | H = waktu hijau |
| AH= 5 | AH= 5 | AH= 5 | AH= 5 | AH = waktu antar hijau |

SKETSA SIMPANG



KONDISI LAPANGAN

| Kode Pendekat | Tipe lingkungan jalan KIM/KOM/AT | Kelas Hambatan T/R | Median Ada/Tidak | kelandaian Pendekat Tanjakan(+)/Turunan(-)% | BKijT Ya/Tidak | Jarak ke kendaraan parkir m | Lebar Pendekat | | | |
|---------------|-------------------------------------|-----------------------|---------------------|--|-------------------|--------------------------------|---------------------------|-----------------------------|--------------------------------------|------------------------------|
| | | | | | | | Pada lajur awal L m | Pada garis henti LM m | Pada lajur belok kiri LBKijT m | Pada lajur keluar LK m |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| U | KOM | R | Ada | 0 | Ya | Tidak | 6.80 | 4.60 | 2.20 | 6.80 |
| T | KOM | R | Ada | 5 | Tidak | Tidak | 6.50 | 6.50 | 0.00 | 4.75 |
| S | KOM | R | Tidak | 2 | Ya | Tidak | 6.30 | 4.00 | 2.30 | 5.50 |
| B | KOM | R | Tidak | 0 | Ya | Tidak | 4.75 | 2.55 | 2.20 | 5.00 |

FORMULIR SIS-II

| | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|------------------|--|--|--|--|--|--|--|
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | Ditangani oleh : | | | | | | | |
| | | Kota : Yogyakarta | | | | | | | | | | | |
| ARUS LALU LINTAS | | Simpang : Jl.Letjen Suprpto - Jl.Pembela Tanah Air - Jl.Jlagran Lor | | | | | | | | | | | |
| | | Ukuran Kota : 388.627 Juta Jiwa | | | | | | | | | | | |
| | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | |
| | | Periode : Jam puncak siang (12.45 - 13.45) WIB | | | | | | | | | | | |

| Kode Pendekat | Arah | KENDARAAN BERMOTOR | | | | | | | | | | | | Kend.tak bermotor | | | |
|---------------|--------------|--|------------|----------|--|------------|----------|---|------------|----------|-------------------------------|------------|----------|-----------------------------------|------------------------------------|--|--|
| | | qkr | | | qkb | | | qSM | | | QKBM | | | RBKi Rasio belok ke kiri | RBKa Rasio belok ke kanan | QKTB Arus kend tak ber- motor kend/jam | RKTb Rasio QKBM thd (QKTB+Q KBM) |
| | | ekr terlindung = 1,0 ekr terlawan = 1,0 | | | ekr terlindung = 1,3 ekr terlawan = 1,3 | | | ekr terlindung = 0,15 ekr terlawan = 0,4 | | | Total arus kendaraan bermotor | | | | | | |
| | | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | | | | |
| | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| U | Bki / BKiJT | 79 | 79 | 79 | 8 | 10 | 10 | 254 | 38 | 102 | 341 | 128 | 191 | 0.11 | | 3 | |
| | LRS | 268 | 268 | 268 | 7 | 9 | 9 | 1486 | 223 | 594 | 1761 | 500 | 872 | | | 4 | |
| | Bka | 188 | 188 | 188 | 8 | 10 | 10 | 943 | 141 | 377 | 1139 | 340 | 576 | | 0.35 | 4 | |
| | Total | 535 | 535 | 535 | 23 | 30 | 30 | 2683 | 402 | 1073 | 3241 | 967 | 1638 | | | 11 | 0.0034 |
| T | Bki / BKiJT | 22 | 22 | 22 | 2 | 3 | 3 | 44 | 7 | 18 | 68 | 31 | 42 | 0.04 | | 0 | |
| | LRS | 172 | 172 | 172 | 2 | 3 | 3 | 485 | 73 | 194 | 659 | 247 | 369 | | | 2 | |
| | Bka | 252 | 252 | 252 | 24 | 31 | 31 | 575 | 86 | 230 | 851 | 369 | 513 | | 0.54 | 2 | |
| | Total | 446 | 446 | 446 | 51 | 5 | 36 | 1104 | 166 | 442 | 1578 | 648 | 924 | | | 4 | 0.0025 |
| S | Bki / BKiJT | 111 | 111 | 111 | 8 | 10 | 10 | 648 | 97 | 259 | 767 | 219 | 381 | 0.30 | | 6 | |
| | LRS | 266 | 266 | 266 | 7 | 9 | 9 | 1375 | 206 | 550 | 1648 | 481 | 825 | | | 7 | |
| | Bka | 29 | 29 | 29 | 3 | 4 | 4 | 99 | 15 | 40 | 131 | 48 | 73 | | 0.05 | 2 | |
| | Total | 406 | 406 | 406 | 18 | 23 | 23 | 2122 | 318 | 849 | 2546 | 748 | 1278 | | | 15 | 0.0059 |
| B | Bki / BKiJT | 252 | 252 | 252 | 11 | 0 | 14 | 1373 | 206 | 549 | 1636 | 458 | 816 | 0.64 | | 5 | |
| | LRS | 115 | 115 | 115 | 4 | 5 | 5 | 413 | 62 | 165 | 532 | 182 | 285 | | | 6 | |
| | Bka | 42 | 42 | 42 | 4 | 5 | 5 | 353 | 53 | 141 | 399 | 100 | 188 | | 0.16 | 7 | |
| | Total | 409 | 409 | 409 | 19 | 10 | 25 | 2139 | 321 | 856 | 2567 | 740 | 1289 | | | 18 | 0.0070 |

FORMULIR SIS-III

| | | | | | | | |
|---|------------------------------|---|----------|--|----------|----------|---------------|
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | |
| WAKTU ANTAR HIJAU WAKTU HILANG | | Ditangani Oleh : | | | | | |
| | | Kota : Yogyakarta | | | | | |
| | | Simpang : Jl.Letjen Suprpto - Jl. Pembela Tanah Air - Jl. Jlagran Lor | | | | | |
| | | Perihal : Pengaturan Simpang Empat Fase | | | | | |
| LALULINTAS BERANGKAT | | LALU LINTAS DATANG | | | | | Msemua |
| Kode Pendekat | Kecepatan VKB (m/dtk) | Kode Pendekat | U | T | S | B | |
| | | Kecepatan VKD (m/dtk) | 10 | 10 | 10 | 10 | (detik) |
| U | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| T | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| S | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| B | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| | | | | Penentuan Msemua | | | |
| | | | | Fase 1 --> Fase 2 | | 2 | |
| | | | | Fase 2 --> Fase 3 | | 2 | |
| | | | | Fase 3 --> Fase 4 | | 2 | |
| | | | | Fase 4 --> Fase 1 | | 2 | |
| | | | | Ksemuan Fase (3 detik per fase) | | 12 | |
| | | | | HH = \sum(Msemua+Ksemua Fase) (det/siklus) | | 20 | |

| <p>SIMPANG APILL</p> <p>PENENTUAN WAKTU ISYARAT</p> <p>KAPASITAS</p> | | | Tanggal : 13 Agustus 2016 | | | | | | | | | | | | | | Ditangani oleh : | | | | | |
|--|---------------------|---------------|--|------|---|----------------------------|-------------------------------|--------------------|---|---------------------|--------|------|------|--------------|--------|----------------------------------|----------------------------|----------------------------|---|-----------------------------|--------------|----------------------|
| | | | Kota : Yogyakarta | | | | | | | | | | | | | | | | | | | |
| | | | Simpang : Jalan Letjen Suprpto - Jalan Pembela Tanah Air - Jalan Jlagran Lor | | | | | | | | | | | | | | | | | | | |
| | | | Ukuran Kota : 388.627 juta jiwa | | | | | | | | | | | | | | | | | | | |
| | | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | | | | | |
| Periode : Jam Puncak Siang (12.45 – 13.45) WIB | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi arus lalu lintas : | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi Arus Lalu Lintas, skr/jam | | | Fase 1 | | | | Fase 2 | | | | Fase 3 | | | | Fase 4 | | | | | | | |
| Kode pendekat | Hijau dalam fase ke | Tipe pendekat | Rasio kendaraan belok | | | Arus belok kanan, qBKa | | Lebar Efektif Le m | Arus jenuh, S | | | | | | | | Arus lalu lintas Q skr/jam | Rasio Arus, RQ/S RQ/S= Q/S | Rasio Fase RF | Waktu hijau per Fase (i) Hi | Kapasitas Ci | Derajat Kejenuhan DJ |
| | | | RBKiJT | RBKi | RBKa | Dari arah ditinjau skr/jam | Dari arah ber-lawanan skr/jam | | Faktor-faktor penyesuaian | | | | | | | | | | | | | |
| | | | | | | | | | Arus jenuh dasar S0 skr/jam | Semua tipe pendekat | | | | Hanya Tipe P | | Arus jenuh disesuaikan S skr/jam | | | | | | |
| | | | | | | | | | | FUK | FHS | FG | FP | FBKa | FBKi | | | | | | | |
| $S_0 = 600 \times Le$ $S = S_0 \times FHS \times FUK \times FG \times FP \times FBKi \times FBKa$ $RF = \frac{RQ/S \text{ Kritis}}{RAS}$ $C = S \times \frac{H}{c}$ $DJ = \frac{Q}{C}$ | | | | | | | | | | | | | | | | | | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) |
| U | 1 | P | 0.11 | | 0.35 | 340 | 48 | 4.60 | 2760 | 0.83 | 0.95 | 1.00 | 1.00 | 1.09 | 1.00 | 2374 | 840 | 0.354 | 0.337 | 110 | 568 | 1.479 |
| T | 2 | P | | 0.04 | 0.54 | 369 | 100 | 6.50 | 3900 | 0.83 | 0.95 | 0.95 | 1.00 | 1.14 | 0.99 | 3310 | 648 | 0.196 | 0.187 | 110 | 792 | 0.819 |
| S | 3 | P | 0.30 | | 0.05 | 48 | 340 | 4.00 | 2400 | 0.83 | 0.95 | 0.98 | 1.00 | 1.01 | 1.00 | 1879 | 529 | 0.282 | 0.269 | 100 | 408 | 1.295 |
| B | 4 | P | 0.64 | | 0.16 | 100 | 369 | 2.55 | 1530 | 0.83 | 0.98 | 1.00 | 1.00 | 1.04 | 1.00 | 1296 | 282 | 0.218 | 0.207 | 120 | 338 | 0.834 |
| Waktu hilang total, HH Total, detik = | | | 20 | | Waktu siklus pra penyesuaian, cbs = 460 detik | | | | RAS = $\sum R \text{ Q/S kritis} = 1.049$ | | | | | | | | | | Waktu siklus disesuaikan = $\sum Hi + HH$ c = 460 detik | | | |

| | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|------------------|--|--|--|
| SIMPANG APILL PANJANG ANTRIAN JUMLAH KENDARAAN HENTI TUNDAAN | | | | | Tanggal : 13 Agustus 2016 | | | | Ditangani oleh : | | | |
| | | | | | Kota : Yogyakarta | | | | | | | |
| | | | | | Simpang : Jalan Letjen Suprpto — Jalan Pembela Tanah Air — Jalan Jlagran Lor | | | | | | | |
| | | | | | Ukuran kota: 388.627 Juta Jiwa | | | | | | | |
| | | | | | Perihal : Empat fase | | | | | | | |
| | | | | | Periode : Jam Puncak Sore (12.45 - 13.45) WIB | | | | | | | |

| Kode pendekat | Arus lalu lintas Q skr/jam | Kapasitas C skr/jam | Derajat kejenuhan DJ DJ | Rasio hijau RH = Hi/c | Jumlah kendaraan antri (skr) | | | | Panjang Antrian PA m | Rasio kendaraan terhenti RKH | Jumlah kendaraan terhenti NKH skr | Tundaan | | | | |
|---|--|-----------------------------------|---------------------------------------|---------------------------------|------------------------------|----------------|---------------------------------------|-------------------|------------------------------------|-------------------------------------|---|--|---|---|-----------------------------------|---------|
| | | | | | NQ1 skr | NQ2 skr | Total NQ = NQ1 + NQ2 skr | NQ MAX skr | | | | Tundaan lalu lintas rata-rata TL det/skr | Tundaan geometri rata-rata TG det/skr | Tundaan rata-rata T=TL+TG det/skr | Tundaan total T x Q ekr.det | |
| | | | | | | | | | | | | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | |
| U | 840 | 568 | 1.479 | 0.239 | 83.5 | 126.4 | 209.8 | 279 | 1212 | 1.759 | 1478 | 735.1 | 1.9 | 737.0 | 619114 | |
| T | 648 | 792 | 0.819 | 0.239 | 26.3 | 78.3 | 104.6 | 140 | 432 | 1.137 | 737 | 285.0 | 4.5 | 289.6 | 187639 | |
| S | 529 | 408 | 1.295 | 0.217 | 46.5 | 73.6 | 120.2 | 161 | 804 | 1.600 | 846 | 606.6 | 6.4 | 613.0 | 324283 | |
| B | 282 | 338 | 0.834 | 0.261 | 24.2 | 34.0 | 58.2 | 79 | 623 | 1.454 | 410 | 418.1 | 5.8 | 423.9 | 119537 | |
| Total jumlah kendaraan terhenti = | | | | | | | | | | | 3471 | Total tundaan = | | | | 1250573 |
| Kend. Terhenti rata-rata, (henti/skr) = | | | | | | | | | | | 1.12 | Tundaan simpang rata-rata (det/skr) = | | | | 403.0 |

| | |
|--------|------|
| Qtotal | 3103 |
|--------|------|

$$N_{q1} = 0,25xcx \left\{ (D_j - 1) + \sqrt{(D_j - 1)^2 + \frac{8x(D_j - 0,5)}{c}} \right\}$$

$$N_{q2} = cx \frac{(1 - R_h)}{(1 - R_h x D_j)} x \frac{Q}{3600}$$

$$P_A = N_q x \frac{20}{L_M}$$

$$R_{KH} = 0,9 x \frac{N_q}{Qxc} x 3600$$

$$N_{KH} = QxR_{KH}$$

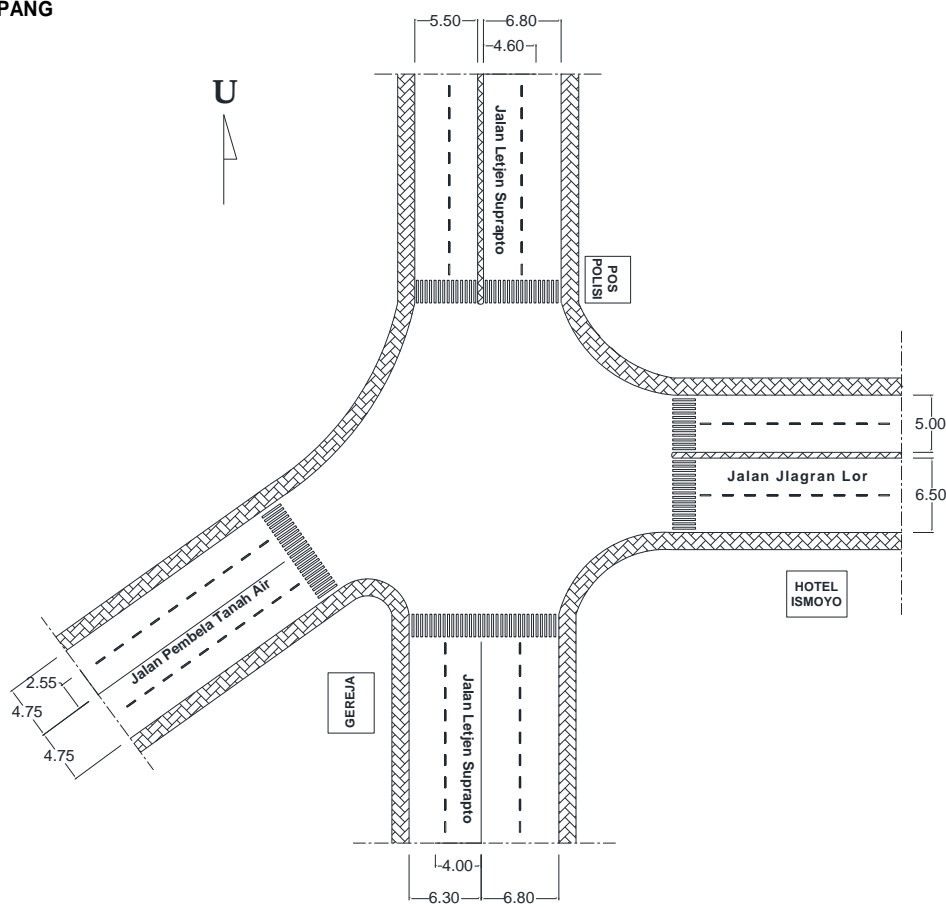
$$T_L = cx \frac{0,5x(1 - R_h)^2}{(1 - R_h x D_j)} + \frac{N_{q1} x 3600}{C}$$

$$T_G = (1 - R_{KH}) x P_b x 6 + (R_{KH} x 4)$$

FORMULIR SIS-I

| SIMPANG APILL | | | | Tanggal : 13 Agustus 2016 | Ditandatangani oleh : |
|--|--------|--------|--------|--|-----------------------|
| DATA: GEOMETRIK PENGATURAN LALU LINTAS LINGKUNGAN | | | | Kota : Yogyakarta | |
| | | | | Simpang : Jl.Letjen Suprpto-Jl.Pembela Tanah Air-Jl.Jagran Lor | |
| | | | | Ukuran Kota : 388.627 juta jiwa | |
| | | | | Perihal : Pengaturan simpang empat fase | |
| | | | | Periode : Jam puncak sore (12.45 - 13.45) hari libur | |
| Sketsa Fase APILL | | | | | |
| Fase 1 | Fase 2 | Fase 3 | Fase 4 | Waktu siklus , c | |
| | | | | c = 135 detik | |
| | | | | Waktu hilang total, HH | |
| | | | | HH= Σ AH = AH 20 | |
| H = 35 | H = 20 | H = 35 | H = 25 | H = waktu hijau | |
| AH = 5 | AH = 5 | AH = 5 | AH = 5 | AH = waktu antar hijau | |

SKETSA SIMPANG



KONDISI LAPANGAN

| Kode Pendekat | Tipe lingkungan jalan KIM/KOM/AT | Kelas Hambatan T/R | Median Ada/Tidak | kelandaian Pendekat Tanjakan(+)/Turunan(-)% | BKIJT Ya/Tidak | Jarak ke kendaraan parkir m | Lebar Pendekat | | | |
|---------------|-------------------------------------|-----------------------|---------------------|--|-------------------|--------------------------------|---------------------------|-----------------------------|--------------------------------------|------------------------------|
| | | | | | | | Pada lajur awal L m | Pada garis henti LM m | Pada lajur belok kiri LBKIJT m | Pada lajur keluar LK m |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| U | KOM | R | Ada | 0 | Ya | Tidak | 6.80 | 6.80 | 0.00 | 6.80 |
| T | KOM | R | Ada | 5 | Tidak | Tidak | 6.50 | 6.50 | 0.00 | 4.75 |
| S | KOM | R | Tidak | 2 | Ya | Tidak | 6.30 | 6.30 | 0.00 | 5.50 |
| B | KOM | R | Tidak | 0 | Ya | Tidak | 4.75 | 4.75 | 2.20 | 5.00 |

FORMULIR SIS-II

| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | | | | | Ditangani oleh : | | | | | | |
|------------------|--------------|---|------------|----------|--|------------|----------|---|------------|----------|-------------------------------|------------|----------|-----------------------------------|------------------------------------|--|--|
| | | Kota : Yogyakarta | | | | | | | | | | | | | | | |
| ARUS LALU LINTAS | | Simpang : Jl.Letjen Suprpto - Jl.Pembela Tanah Air - Jl.Jlagran Lor | | | | | | | | | | | | | | | |
| | | Ukuran Kota : 388.627 Juta Jiwa | | | | | | | | | | | | | | | |
| | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | |
| | | Periode : Jam puncak siang (12.45 - 13.45) WIB | | | | | | | | | | | | | | | |
| Kode Pendekat | Arah | KENDARAAN BERMOTOR | | | | | | | | | | | | Kend.tak bermotor | | | |
| | | qkr | | | qkb | | | qSM | | | QKBM | | | RBKi Rasio belok ke kiri | RBKa Rasio belok ke kanan | QKTB Arus kend tak ber- motor kend/jam | RKTb Rasio QKBM thd (QKTB+Q KBM) |
| | | ekr terlindung = 1,0 ekr terlawan = 1,0 | | | ekr terlindung = 1,3 ekr terlawan = 1,3 | | | ekr terlindung = 0,15 ekr terlawan = 0,4 | | | Total arus kendaraan bermotor | | | | | | |
| | | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | | | | |
| | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| U | Bki / BKiJT | 79 | 79 | 79 | 8 | 10 | 10 | 254 | 38 | 102 | 341 | 128 | 191 | 0.11 | | 3 | |
| | LRS | 268 | 268 | 268 | 7 | 9 | 9 | 1486 | 223 | 594 | 1761 | 500 | 872 | | | 4 | |
| | Bka | 188 | 188 | 188 | 8 | 10 | 10 | 943 | 141 | 377 | 1139 | 340 | 576 | | 0.35 | 4 | |
| | Total | 535 | 535 | 535 | 23 | 30 | 30 | 2683 | 402 | 1073 | 3241 | 967 | 1638 | | | 11 | 0.0034 |
| T | Bki / BKiJT | 22 | 22 | 22 | 2 | 3 | 3 | 44 | 7 | 18 | 68 | 31 | 42 | 0.04 | | 0 | |
| | LRS | 172 | 172 | 172 | 2 | 3 | 3 | 485 | 73 | 194 | 659 | 247 | 369 | | | 2 | |
| | Bka | 252 | 252 | 252 | 24 | 31 | 31 | 575 | 86 | 230 | 851 | 369 | 513 | | 0.54 | 2 | |
| | Total | 446 | 446 | 446 | 51 | 5 | 36 | 1104 | 166 | 442 | 1578 | 648 | 924 | | | 4 | 0.0025 |
| S | Bki / BKiJT | 111 | 111 | 111 | 8 | 10 | 10 | 648 | 97 | 259 | 767 | 219 | 381 | 0.30 | | 6 | |
| | LRS | 266 | 266 | 266 | 7 | 9 | 9 | 1375 | 206 | 550 | 1648 | 481 | 825 | | | 7 | |
| | Bka | 29 | 29 | 29 | 3 | 4 | 4 | 99 | 15 | 40 | 131 | 48 | 73 | | 0.05 | 2 | |
| | Total | 406 | 406 | 406 | 18 | 23 | 23 | 2122 | 318 | 849 | 2546 | 748 | 1278 | | | 15 | 0.0059 |
| B | Bki / BKiJT | 252 | 252 | 252 | 11 | 0 | 14 | 1373 | 206 | 549 | 1636 | 458 | 816 | 0.64 | | 5 | |
| | LRS | 115 | 115 | 115 | 4 | 5 | 5 | 413 | 62 | 165 | 532 | 182 | 285 | | | 6 | |
| | Bka | 42 | 42 | 42 | 4 | 5 | 5 | 353 | 53 | 141 | 399 | 100 | 188 | | 0.16 | 7 | |
| | Total | 409 | 409 | 409 | 19 | 10 | 25 | 2139 | 321 | 856 | 2567 | 740 | 1289 | | | 18 | 0.0070 |

FORMULIR SIS-III

| | | | | | | | |
|---|------------------------------|---|----------------|--|----------------|----------------|---------------|
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | |
| WAKTU ANTAR HIJAU WAKTU HILANG | | Ditangani Oleh : | | | | | |
| | | Kota : Yogyakarta | | | | | |
| | | Simpang : Jl.Letjen Suprpto - Jl. Pembela Tanah Air - Jl. Jlagran Lor | | | | | |
| | | Perihal : Pengaturan Simpang Empat Fase | | | | | |
| LALULINTAS BERANGKAT | | LALU LINTAS DATANG | | | | | Msemua |
| Kode Pendekat | Kecepatan VKB (m/dtk) | Kode Pendekat Kecepatan VKD (m/dtk) | U 10 | T 10 | S 10 | B 10 | (detik) |
| U | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| T | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| S | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| B | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| | | | | Penentuan Msemua | | | |
| | | | | Fase 1 --> Fase 2 | | 2 | |
| | | | | Fase 2 --> Fase 3 | | 2 | |
| | | | | Fase 3 --> Fase 4 | | 2 | |
| | | | | Fase 4 --> Fase 1 | | 2 | |
| | | | | Ksemuan Fase (3 detik per fase) | | 12 | |
| | | | | HH = \sum(Msemua+Ksemua Fase) (det/siklus) | | 20 | |

| SIMPANG APILL PENENTUAN WAKTU ISYARAT KAPASITAS | | | Tanggal : 13 Agustus 2016 | | | | | | | | | | | | | | Ditangani oleh : | | | | | | | |
|--|---------------------|---------------|--|------|---|----------------------------|------------------------------|---|-----------------------------|---------------------------|------|--------|------|--------------|------|----------------------------------|---|------------------|---------------|-----------------------------|--------------|----------------------|--|--|
| | | | Kota : Yogyakarta | | | | | | | | | | | | | | | | | | | | | |
| | | | Simpang : Jalan Letjen Suprpto - Jalan Pembela Tanah Air - Jalan Jlagran Lor | | | | | | | | | | | | | | | | | | | | | |
| | | | Ukuran Kota : 388.627 juta jiwa | | | | | | | | | | | | | | | | | | | | | |
| | | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | | | | | | | |
| Periode : Jam Puncak Siang (12.45 – 13.45) WIB | | | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi arus lalu lintas : | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | |
| Distribusi Arus Lalu Lintas, skr/jam | | | Fase 1 | | | Fase 2 | | | Fase 3 | | | Fase 4 | | | | | | | | | | | | |
| Kode pendekat | Hijau dalam fase ke | Tipe pendekat | Rasio kendaraan belok | | | Arus belok kanan, qBKa | | Lebar Efektif Le m | Arus jenuh, S | | | | | | | | Arus lalu lintas Q skr/jam | Rasio Arus, RQ/S | Rasio Fase RF | Waktu hijau per Fase (i) Hi | Kapasitas Ci | Derajat Kejenuhan DJ | | |
| | | | RBKiJT | RBKi | RBKa | Dari arah ditinjau skr/jam | Dari arah berlawanan skr/jam | | Arus jenuh dasar S0 skr/jam | Faktor-faktor penyesuaian | | | | | | Arus jenuh disesuaikan S skr/jam | | | | | | | | |
| | | | | | | | | | | Semua tipe pendekat | | | | Hanya Tipe P | | | | | | | | | | |
| | | | | | | | | | | FUK | FHS | FG | FP | FBKa | FBKi | | | | | | | | | |
| | | | | | | | | $S_0 = 600 \times Le$ $S = S_0 \times FHS \times FUK \times FG \times FP \times FBKa \times FBKi$ $RF = \frac{RQ/S \text{ Kritis}}{RAS}$ $C = S$ $DJ = \frac{Q}{C}$ | | | | | | | | | | | | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) | | |
| U | 1 | P | 0.11 | | 0.35 | 340 | 48 | 6.80 | 4080 | 0.83 | 0.95 | 1.00 | 1.00 | 1.09 | 1.00 | 3510 | 967 | 0.276 | 0.290 | 35 | 910 | 1.063 | | |
| T | 2 | P | | 0.04 | 0.54 | 369 | 100 | 6.50 | 3900 | 0.83 | 0.95 | 0.95 | 1.00 | 1.14 | 0.99 | 3310 | 648 | 0.196 | 0.206 | 20 | 490 | 1.321 | | |
| S | 3 | P | 0.30 | | 0.05 | 48 | 340 | 6.30 | 3780 | 0.83 | 0.95 | 0.98 | 1.00 | 1.01 | 1.00 | 2959 | 748 | 0.253 | 0.267 | 35 | 767 | 0.975 | | |
| B | 4 | P | 0.64 | | 0.16 | 100 | 369 | 2.55 | 1530 | 0.83 | 0.95 | 1.00 | 1.00 | 1.04 | 1.00 | 1257 | 282 | 0.224 | 0.237 | 25 | 233 | 1.212 | | |
| Waktu hilang total, HH Total, detik = | | | 20 | | Waktu siklus pra penyesuaian, cbs = 135 detik | | | | | | | | | | | | RAS = $\sum R \text{ Q/S kritis} = 0.948$ | | | | | | | |
| | | | | | Waktu siklus disesuaikan = $\sum HI + HH$ | | c = 135 detik | | | | | | | | | | | | | | | | | |

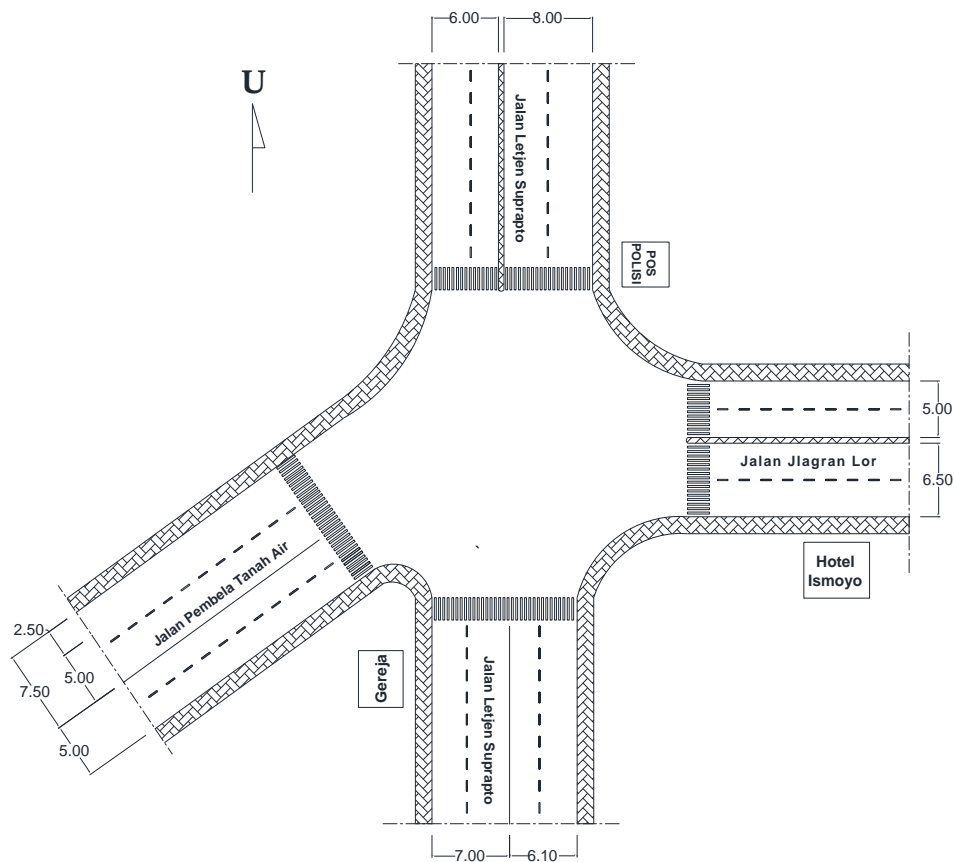
FORMULIR SIS-V

| SIMPANG APILL | | | | | Tanggal : 13 Agustus 2016 | | Ditangani oleh : | | | | | | | | |
|--|-----------------------|--|-------------------------|-----------------------------|---|------|----------------------------|--------|----------------------------|--|----------------------------------|--|---|---|-----------------------------------|
| PANJANG ANTRIAN | | | | | Kota : Yogyakarta | | | | | | | | | | |
| JUMLAH KENDARAAN HENTI | | | | | Simpang : Jalan Letjen Suprpto —Jalan Pembela Tanah Air — Jalan Jlagran Lor | | | | | | | | | | |
| TUNDAAN | | | | | Ukuran kota: 388.627 Juta Jiwa | | | | | | | | | | |
| | | | | | Perihal : Empat fase | | | | | | | | | | |
| | | | | | Periode : Jam Puncak Sore (12.45 - 13.45) WIB | | | | | | | | | | |
| Kode pendekat | Arus lalu lintas Q | Kapasitas C | Derajat kejenuhan DJ | Rasio hijau RH = Hi/c | Jumlah kendaraan antri (skr) | | | | Panjang Antrian PA m | Rasio kendaraan terhenti RKH | Jumlah kendaraan terhenti NKH | Tundaan | | | |
| | | | | | NQ1 | NQ2 | Total NQ = NQ1 + NQ2 | NQ MAX | | | | Tundaan lalu lintas rata-rata TL det/skr | Tundaan geometri rata-rata TG det/skr | Tundaan rata-rata T=TL+TG det/skr | Tundaan total T x Q ekr.det |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| U | 967 | 910 | 1.063 | 0.259 | 6.7 | 37.1 | 43.7 | 60 | 178 | 1.085 | 1050 | 77.5 | 3.8 | 81.2 | 78552 |
| T | 648 | 490 | 1.321 | 0.148 | 16.6 | 25.7 | 42.4 | 59 | 180 | 1.569 | 1017 | 182.9 | 6.3 | 189.2 | 122600 |
| S | 748 | 767 | 0.975 | 0.259 | 5.7 | 27.8 | 33.6 | 47 | 149 | 1.077 | 805 | 76.5 | 4.3 | 80.8 | 60467 |
| B | 282 | 233 | 1.212 | 0.185 | 11.5 | 11.1 | 22.6 | 33 | 256 | 1.923 | 542 | 235.1 | 7.7 | 242.8 | 68481 |
| Total jumlah kendaraan terhenti = | | | | | | | | | | | 3414 | Total tundaan = | | | 330099 |
| Kend. Terhenti rata-rata, (henti/skr) = | | | | | | | | | | | 1.10 | Tundaan simpang rata-rata (det/skr) = | | | 106.4 |
| Qtotal | 3103 | $N_{q1} = 0,25xcx \left\{ (D_j - 1) + \sqrt{(D_j - 1)^2 + \frac{8x(D_j - 0,5)}{c}} \right\}$ | | | | | | | | | | | | | |
| $N_{q2} = cx \frac{(1 - R_h)}{(1 - R_h x D_j)} x \frac{Q}{3600}$ | | | | | $R_{KH} = 0,9x \frac{N_q}{Qxc}$ | | | | | $T_L = cx \frac{0,5x(1 - R_h)^2}{(1 - R_h x D_j)} + \frac{N_{q1} x 3600}{C}$ | | | | | |
| $P_A = N_q x \frac{20}{L_M}$ | | | | | $N_{KH} = QxR_{KH}$ | | | | | $T_G = (1 - R_{KH}) x P_b x 6 + (R_{KH} x 4)$ | | | | | |

FORMULIR SIS-I

| | | | | | | | | | |
|--|--|--------|--|---|--|-----------------------|--|------------------------|--|
| SIMPANG APILL DATA: GEOMETRIK PENGATURAN LALU LINTAS LINGKUNGAN | | | | Tanggal : 13 Agustus 2016 | | Ditandatangani oleh : | | | |
| | | | | Kota : Yogyakarta | | | | | |
| | | | | Simpang : Jl.Letjen Suprpto-Jl.Pembela Tanah Air-Jl.Jlagran Lor | | | | | |
| | | | | Ukuran Kota : 388.627 juta jiwa | | | | | |
| | | | | Perihal : Pengaturan simpang empat fase | | | | | |
| Periode : Jam puncak sore (12.45 - 13.45) hari libur | | | | | | | | | |
| Sketsa Fase APILL | | | | | | | | | |
| Fase 1 | | Fase 2 | | Fase 3 | | Fase 4 | | Waktu siklus , c | |
| | | | | | | | | c = 135 detik | |
| H = 35 | | H = 20 | | H = 35 | | H = 25 | | Waktu hilang total, HH | |
| AH = 5 | | AH = 5 | | AH = 5 | | AH = 5 | | HH = Σ AH = 20 | |
| | | | | | | | | H = waktu hijau | |
| | | | | | | | | AH = waktu antar hijau | |

SKETSA SIMPANG



KONDISI LAPANGAN

| Kode Pendekat | Tipe lingkungan jalan KIM/KOM/AT | Kelas Hambatan T/R | Median Ada/Tidak | kelandaian Pendekat Tanjakan(+)/Turunan(-)% | BKIJT Ya/Tidak | Jarak ke kendaraan parkir m | Lebar Pendekat | | | |
|---------------|-------------------------------------|-----------------------|---------------------|--|-------------------|--------------------------------|---------------------------|-----------------------------|--------------------------------------|------------------------------|
| | | | | | | | Pada lajur awal L m | Pada garis henti LM m | Pada lajur belok kiri LBKIJT m | Pada lajur keluar LK m |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| U | KOM | R | Ada | 0 | Ya | Tidak | 8.00 | 8.00 | 0.00 | 6.10 |
| T | KOM | R | Ada | 5 | Tidak | Tidak | 6.50 | 6.50 | 0.00 | 5.00 |
| S | KOM | R | Tidak | 2 | Ya | Tidak | 6.50 | 6.50 | 0.00 | 6.00 |
| B | KOM | R | Tidak | 0 | Ya | Tidak | 5.00 | 5.00 | 2.20 | 5.00 |

FORMULIR SIS-II

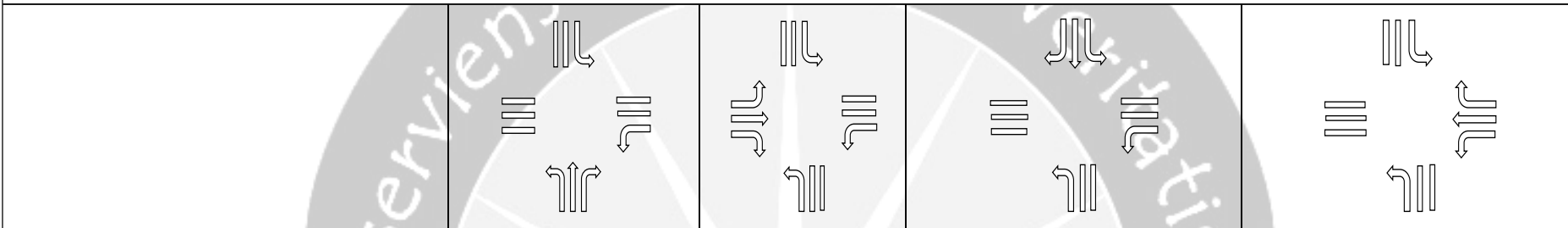
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | Ditangani oleh : | | | | | | | | | | | | | | | | | | | |
|------------------|--------------|---|------------|----------|--|------------------|----------|---|------------|----------|-------------------------------|------------|----------|-----------------------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|
| | | Kota : Yogyakarta | | | | | | | | | | | | | | | | | | | | | | | |
| ARUS LALU LINTAS | | Simpang : Jl.Letjen Suprpto - Jl.Pembela Tanah Air - Jl.Jlagran Lor | | | | | | | | | | | | | | | | | | | | | | | |
| | | Ukuran Kota : 388.627 Juta Jiwa | | | | | | | | | | | | | | | | | | | | | | | |
| | | Perihal : Pengaturan simpang empat fase | | | | | | | | | | | | | | | | | | | | | | | |
| | | Periode : Jam puncak siang (12.45 - 13.45) WIB | | | | | | | | | | | | | | | | | | | | | | | |
| Kode Pendekat | Arah | KENDARAAN BERMOTOR | | | | | | | | | | | | Kend.tak bermotor | | | | | | | | | | | |
| | | qkr | | | qkb | | | qSM | | | QKBM | | | RBKi Rasio belok ke kiri | RBKa Rasio belok ke kanan | QKTB Arus kend tak ber- motor kend/jam | RKTB Rasio QKBM thd (QKTB+Q KBM) | | | | | | | | |
| | | ekr terlindung = 1,0 ekr terlawan = 1,0 | | | ekr terlindung = 1,3 ekr terlawan = 1,3 | | | ekr terlindung = 0,15 ekr terlawan = 0,4 | | | Total arus kendaraan bermotor | | | | | | | | | | | | | | |
| | | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | kend/jam | Terlindung | Terlawan | | | | | | | | | | | | |
| | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | skr/jam | skr/jam | | | | | | | | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | | | | | | | | |
| U | Bki / BKiJT | 79 | 79 | 79 | 8 | 10 | 10 | 254 | 38 | 102 | 341 | 128 | 191 | 0.11 | | 3 | | | | | | | | | |
| | LRS | 268 | 268 | 268 | 7 | 9 | 9 | 1486 | 223 | 594 | 1761 | 500 | 872 | | | 4 | | | | | | | | | |
| | Bka | 188 | 188 | 188 | 8 | 10 | 10 | 943 | 141 | 377 | 1139 | 340 | 576 | | 0.35 | 4 | | | | | | | | | |
| | Total | 535 | 535 | 535 | 23 | 30 | 30 | 2683 | 402 | 1073 | 3241 | 967 | 1638 | | | 11 | 0.0034 | | | | | | | | |
| T | Bki / BKiJT | 22 | 22 | 22 | 2 | 3 | 3 | 44 | 7 | 18 | 68 | 31 | 42 | 0.04 | | 0 | | | | | | | | | |
| | LRS | 172 | 172 | 172 | 2 | 3 | 3 | 485 | 73 | 194 | 659 | 247 | 369 | | | 2 | | | | | | | | | |
| | Bka | 252 | 252 | 252 | 24 | 31 | 31 | 575 | 86 | 230 | 851 | 369 | 513 | | 0.54 | 2 | | | | | | | | | |
| | Total | 446 | 446 | 446 | 51 | 5 | 36 | 1104 | 166 | 442 | 1578 | 648 | 924 | | | 4 | 0.0025 | | | | | | | | |
| S | Bki / BKiJT | 111 | 111 | 111 | 8 | 10 | 10 | 648 | 97 | 259 | 767 | 219 | 381 | 0.30 | | 6 | | | | | | | | | |
| | LRS | 266 | 266 | 266 | 7 | 9 | 9 | 1375 | 206 | 550 | 1648 | 481 | 825 | | | 7 | | | | | | | | | |
| | Bka | 29 | 29 | 29 | 3 | 4 | 4 | 99 | 15 | 40 | 131 | 48 | 73 | | 0.05 | 2 | | | | | | | | | |
| | Total | 406 | 406 | 406 | 18 | 23 | 23 | 2122 | 318 | 849 | 2546 | 748 | 1278 | | | 15 | 0.0059 | | | | | | | | |
| B | Bki / BKiJT | 252 | 252 | 252 | 11 | 0 | 14 | 1373 | 206 | 549 | 1636 | 458 | 816 | 0.64 | | 5 | | | | | | | | | |
| | LRS | 115 | 115 | 115 | 4 | 5 | 5 | 413 | 62 | 165 | 532 | 182 | 285 | | | 6 | | | | | | | | | |
| | Bka | 42 | 42 | 42 | 4 | 5 | 5 | 353 | 53 | 141 | 399 | 100 | 188 | | 0.16 | 7 | | | | | | | | | |
| | Total | 409 | 409 | 409 | 19 | 10 | 25 | 2139 | 321 | 856 | 2567 | 740 | 1289 | | | 18 | 0.0070 | | | | | | | | |

FORMULIR SIS-III

| | | | | | | | |
|---|------------------------------|---|----------------|--|----------------|----------------|---------------|
| SIMPANG APILL | | Tanggal : 13 Agustus 2016 | | | | | |
| WAKTU ANTAR HIJAU WAKTU HILANG | | Ditangani Oleh : | | | | | |
| | | Kota : Yogyakarta | | | | | |
| | | Simpang : Jl.Letjen Suprpto - Jl. Pembela Tanah Air - Jl. Jlagran Lor | | | | | |
| | | Perihal : Pengaturan Simpang Empat Fase | | | | | |
| LALULINTAS BERANGKAT | | LALU LINTAS DATANG | | | | | Msemua |
| Kode Pendekat | Kecepatan VKB (m/dtk) | Kode Pendekat Kecepatan VKD (m/dtk) | U 10 | T 10 | S 10 | B 10 | (detik) |
| U | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| T | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| S | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| B | 10 | Jarak berangkat-datang (m) | | | | | |
| | | Waktu berangkat-datang (dtk)*) | | | | | |
| | | | | Penentuan Msemua | | | |
| | | | | Fase 1 --> Fase 2 | | 2 | |
| | | | | Fase 2 --> Fase 3 | | 2 | |
| | | | | Fase 3 --> Fase 4 | | 2 | |
| | | | | Fase 4 --> Fase 1 | | 2 | |
| | | | | Ksemuan Fase (3 detik per fase) | | 12 | |
| | | | | HH = \sum(Msemua+Ksemua Fase) (det/siklus) | | 20 | |

| | | |
|---|--|------------------|
| <p>SIMPANG APILL</p> <p>PENENTUAN WAKTU ISYARAT</p> <p>KAPASITAS</p> | Tanggal : 13 Agustus 2016 | Ditangani oleh : |
| | Kota : Yogyakarta | |
| | Simpang : Jalan Letjen Suprpto - Jalan Pembela Tanah Air - Jalan Jlagran Lor | |
| | Ukuran Kota : 388.627 juta jiwa | |
| | Perihal : Pengaturan simpang empat fase | |
| | Periode : Jam Puncak Siang (12.45 – 13.45) WIB | |

Distribusi arus lalu lintas :



| Distribusi Arus Lalu Lintas, skr/jam | | | | | | | | Fase 1 | | | Fase 2 | | | Fase 3 | | | Fase 4 | | | | | |
|---------------------------------------|---------------------|---------------|-----------------------|---|------|----------------------------|-------------------------------|--------------------|-----------------------------|--|--------|------|------|--------------|----------------------------------|---|----------------------------|---------------|-----------------------------|--------------|----------------------|--|
| Kode pendekat | Hijau dalam fase ke | Tipe pendekat | Rasio kendaraan belok | | | Arus belok kanan, qBKa | | Lebar Efektif Le m | Arus jenuh, S | | | | | | | Arus lalu lintas Q skr/jam | Rasio Arus, RQ/S RQ/S= Q/S | Rasio Fase RF | Waktu hijau per Fase (i) Hi | Kapasitas Ci | Derajat Kejenuhan DJ | |
| | | | RBKiJT | RBKi | RBKa | Dari arah ditinjau skr/jam | Dari arah ber-lawanan skr/jam | | Arus jenuh dasar S0 skr/jam | Faktor-faktor penyesuaian | | | | | Arus jenuh disesuaikan S skr/jam | | | | | | | |
| | | | | | | | | | | Semua tipe pendekat | | | | Hanya Tipe P | | | | | | | | |
| | | | | | | | | | | FUK | FHS | FG | FP | FBKa | | | | | | | | FBKi |
| | | | | | | | | | | S0 = 600 x Le - S0 x FHS x FUK x FG x FP x FBKi x FB | | | | | | | | | | | | RF = $\frac{RQ/S \text{ Kritis}}{RAS}$ |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) |
| U | 1 | P | 0.11 | | 0.35 | 340 | 48 | 8.00 | 4800 | 0.83 | 0.95 | 1.00 | 1.00 | 1.09 | 1.00 | 4129 | 967 | 0.234 | 0.310 | 95 | 1207 | 0.801 |
| T | 2 | P | | 0.04 | 0.54 | 369 | 100 | 6.50 | 3900 | 0.83 | 0.95 | 0.95 | 1.00 | 1.14 | 0.99 | 3310 | 648 | 0.196 | 0.259 | 80 | 815 | 0.795 |
| S | 3 | P | 0.30 | | 0.05 | 48 | 340 | 7.00 | 4200 | 0.83 | 0.95 | 0.98 | 1.00 | 1.01 | 1.00 | 3288 | 748 | 0.228 | 0.302 | 90 | 910 | 0.822 |
| B | 4 | P | 0.64 | | 0.16 | 100 | 369 | 5.00 | 3000 | 0.98 | 0.95 | 1.00 | 1.00 | 1.04 | 1.00 | 2909 | 282 | 0.097 | 0.128 | 40 | 358 | 0.788 |
| Waktu hilang total, HH Total, detik = | | | 20 | Waktu siklus pra penyesuaian, cbs = 325 detik | | | | | | | | | | | | RAS = $\sum R \text{ Q/S kritis} = 0.754$ | | | | | | |
| | | | | Waktu siklus disesuaikan = $\sum Hi+HH$ c = 325 detik | | | | | | | | | | | | | | | | | | |

| SIMPANG APILL PANJANG ANTRIAN JUMLAH KENDARAAN HENTI TUNDAAN | | | | | Tanggal : 13 Agustus 2016 | | | | Ditangani oleh : | | | | | | | |
|---|----------------------------------|--|-------------------------|-----------------------------|---|------------|-----------------------------------|---------------|----------------------------|---------------------------------|---|--|---|---|-----------------------------------|--------|
| | | | | | Kota : Yogyakarta | | | | | | | | | | | |
| | | | | | Simpang : Jalan Letjen Suprpto —Jalan Pembela Tanah Air — Jalan Jlagran Lor | | | | | | | | | | | |
| | | | | | Ukuran kota: 388.627 Juta Jiwa | | | | | | | | | | | |
| | | | | | Perihal : Empat fase | | | | | | | | | | | |
| | | | | | Periode : Jam Puncak Sore (12.45 - 13.45) WIB | | | | | | | | | | | |
| Kode pendekat | Arus lalu lintas Q skr/jam | Kapasitas C skr/jam | Derajat kejenuhan DJ | Rasio hijau RH = Hi/c | Jumlah kendaraan antri (skr) | | | | Panjang Antrian PA m | Rasio kendaraan terhenti RKH | Jumlah kendaraan terhenti NKH skr | Tundaan | | | | |
| | | | | | NQ1 skr | NQ2 skr | Total NQ = NQ1 + NQ2 skr | NQ MAX skr | | | | Tundaan lalu lintas rata-rata TL det/skr | Tundaan geometri rata-rata TG det/skr | Tundaan rata-rata T=TL+TG det/skr | Tundaan total T x Q ekr.det | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | |
| U | 967 | 1207 | 0.801 | 0.292 | 1.7 | 40.7 | 42.4 | 62 | 155 | 0.437 | 423 | 111.3 | 3.6 | 114.9 | 111127 | |
| T | 648 | 815 | 0.795 | 0.246 | 1.5 | 40.6 | 42.1 | 58 | 179 | 0.648 | 420 | 121.4 | 2.6 | 124.0 | 80372 | |
| S | 748 | 910 | 0.822 | 0.277 | 1.9 | 40.9 | 42.8 | 64 | 183 | 0.570 | 427 | 117.5 | 2.3 | 119.8 | 89610 | |
| B | 282 | 358 | 0.788 | 0.123 | 1.4 | 40.4 | 41.8 | 50 | 200 | 1.478 | 417 | 152.5 | 5.9 | 158.4 | 44661 | |
| Total jumlah kendaraan terhenti = | | | | | | | | | | | 1686 | Total tundaan = | | | | 325770 |
| Kend. Terhenti rata-rata, (henti/skr) = | | | | | | | | | | | 0.54 | Tundaan simpang rata-rata (det/skr) = | | | | 105.0 |
| Qtotal | 3103 | $N_{q1} = 0,25xcx \left\{ (D_j - 1) + \sqrt{(D_j - 1)^2 + \frac{8x(D_j - 0,5)}{c}} \right\}$ $N_{q2} = cx \frac{(1 - R_h)}{(1 - R_h x D_j)} x \frac{Q}{3600}$ $P_A = N_q x \frac{20}{L_M}$ $R_{KH} = 0,9x \frac{N_q}{Qxc} x 3600$ $N_{KH} = QxR_{KH}$ $T_L = cx \frac{0,5x(1 - R_h)^2}{(1 - R_h x D_j)} + \frac{N_{q1} x 3600}{C}$ $T_G = (1 - R_{KH}) x P_b x 6 + (R_{KH} x 4)$ | | | | | | | | | | | | | | |